

Teaching Public School Teachers about Weather and Climate

Highlight ID: xxxx, Version:

Science teachers in public schools face a difficult challenge to educate tomorrow's leaders about climate and global change while meeting state standards in physics, environmental, and Earth sciences. NSF-sponsored climate modelers at the Center for Multiscale, headquartered at Colorado State University, have developed a 2-credit course on Weather and Climate for Educators that combines advanced undergraduate content with pedagogical innovation and a library of classroom inquiry modules to give teachers the tools they need to succeed. The course is taught during the summer to avoid conflicting with teachers' busy academic-year schedules, and presents a semester's worth of material in five action-packed days.



Standards-based course content is organized by "following the energy" from the Sun through the atmosphere to the Earth's surface and back to space, driving wind, weather, and ocean currents along the way. It is divided into 10 half-day units, each of which is taught according to the "Five E's: Engage, Explore, Explain, Extend, and Evaluate." We begin with a "bang" by surprising teachers with a 5-minute classroom experience (*Engage*) that challenges their assumptions and piques their curiosity. This is followed by a longer inquiry activity (*Explore*) in which participants learn basic physical principles of climate by hands-on experimentation. Formal academic content is then presented through in lecture format with notes and visual aids (*Explain*), after which teachers spend an hour or so working in groups to solve problems in depth (*Extend*). Each unit culminates in a discussion of how the activities and content could fit into existing curricula and classrooms, and how the unit itself could be improved (*Evaluate*).



The course has so far been offered to 65 K-12 teachers over two summers, and is available as a "kit" including all science content, media, and inquiry activities at <http://www.CMMAP.org>. Teachers receive a stipend for their participation, as well as breakfast and lunch each day and about three large boxes of classroom supplies to allow them to easily use or adapt the inquiry activities to their own lessons. They submit a written lesson plan to receive

Top: Teachers learn about the electromagnetic spectrum. Bottom: Experiencing the ideal gas law as "dancing molecules in a box."

Credit: CMMAP

University credit, which is important for their own professional development. At a follow-up evening workshop in the fall, participants return to the Center to share their classroom experience with the kits and content, explore what worked for their students and what didn't, and help us to improve the course. We also want the next generation of leading climate modelers to be excellent teachers, so graduate students at the Center participate in every aspect of the course, and lead the Extend sections of each unit. They gain valuable classroom experience in a fun but very intense week of work. Researchers from CSU's Department of Sociology have conducted interviews and focus groups with participants, to help design and improve the course. Participation in coming years will be expanded to emphasize underrepresented groups and underserved school districts in the region, and from large urban districts nationwide.